WHAT IS CLAIMED IS:

Sub. A1

1. A clay-polymer nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary ammonium compound which comprises a diester quat.

2. The nanocomposite of claim 1, wherein the organoclay is the reaction product of a smectite clay with a diester quat in admixture with further quaternary ammonium compounds having esterified radicals.

3. The nanocomposite of claim 1, wherein the diester quat is in admixture with further quaternary ammonium compounds which are selected from one or more members of the group consisting of triester and monoester quats.

4. The nanocomposite of claim 1, wherein the diester quat is present as greater than 55 wt% of the quaternary mixture.

Sub. A2

5. The nanocomposite of claim 4, wherein any triester quat comprises less than 25 wt% of the quaternary mixture.

6. The nanocomposite of claim 5, wherein the fatty acids corresponding to the esters in the quaternary mixture have a degree of unsaturation such that the iodine value ("IV") is from about 20 to about 90.

7. The nanocomposite of claim 6, wherein the diester quat content is greater than 60 wt%, the triester quat content is less than 20 wt%, and the IV is from about 30 to about 70.

8. The nanocomposite of claim 7, wherein the diester quat content is greater than 62%, the triester quat content is less than 17 wt%, and the IV is from about 40 to about 60.

9. The nanocomposite of claim 8, wherein the IV is from about 45 to about 58.

10. An organoclay useful in preparing clay-polymer nanocomposites comprising the reaction product of a smectite clay with a quaternary ammonium compound which comprises a diester quat in admixture with further quaternary ammonium compounds having esterified radicals.

11. The organoclay composition of claim 10, wherein the diester quat is in admixture with further quaternary ammonium compounds which are selected from one or more members of the group consisting of triester and monoester quats.

12. The organoclay composition of claim 11, wherein the diester quat is present as greater than 55 wt% of the quaternary mixture.

13. The organoclay composition of claim 12, wherein a triester quat is present and comprises less than 25 wt% of the quaternary mixture.

14. An organoclay composition in accordance with claim 13, wherein the quaternary ammonium compound is the reaction product of C_{12} - C_{22} fatty acids or the

hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst, wherein the ratio of fatty acid to alkanolamine is from about 1.40 to 2.0.

15. The organoclay composition of claim 14, wherein the fatty acids corresponding to the esters in the quaternary mixture have a degree of unsaturation such that the iodine value ("IV") is from about 20 to about 90.

16. The organoclay composition of claim 15, wherein the diester quat content is greater than 60 wt%, the triester quat content is less than 20 wt%, and the IV is from about 30 to about 70.

17. The organoclay composition of claim 16, wherein the diester quat content is greater than 62%, the triester quat content is less than 17 wt%, and the IV is from about 40 to about 60.

18. The organoclay composition of claim 17, wherein the IV is from about 45 to about 58.

19. The organoclay composition of claim 18, wherein the smectite is selected from the group consisting of hectorite, montmorillonite, bentonite, beidelite, saponite, stevensite and mixtures thereof.

20. The organoclay composition of claim 19, wherein the smectite comprises hectorite.

21. In the method for preparing a nanocomposite, by treating a smectite clay, with an organic ammonium ion to intercalate the organic molecule between the

silicate layers of the clay, thereby substantially swelling or expanding the interlayer spacing of the smectite; and exfoliating the expanded silicate layers in the presence of or with the assistance of a polymer with which reactive groups on the intercalated organic molecule are compatible, or in the presence of a monomer which is polymerized after being intermixed with the intercalated clay; the improvement which enables very high efficiency in the said exfoliation, comprising:
utilizing as the source of the organic ammonium ion a quaternary ammonium compound which comprises a diester quat.

22. The method of claim 21, wherein the diester quat is in admixture with further quaternary ammonium compounds having esterified radicals.

23. The method of claim 22, wherein the diester quat is in admixture with further quaternary ammonium compounds which are selected from one or more members of the group consisting of triester and monoester quats.

24. The method of claim 23, wherein the diester quat is present as greater than 55 wt% of the quaternary mixture.

25. The method of claim 23, wherein a triester quat is present and comprises less than 25 wt% of the quaternary mixture.

26. The method of claim 25, wherein the quaternary ammonium compound is the reaction product of C_{12} - C_{22} fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst, wherein the ratio of fatty acid to alkanolamine is from about 1.40 to 2.0.

27. The method of claim 26, wherein the fatty acids corresponding to the esters in the quaternary mixture have a degree of unsaturation such that the iodine value ("IV") is from about 20 to about 90.

28. The method of claim 27, wherein the diester quat content is greater than 60 wt%, the triester quat content is less than 20 wt%, and the IV is from about 30 to about 70.

29. The method of claim 28, wherein the diester quat content is greater than 62%, the triester quat content is less than 17 wt%, and the IV is from about 40 to about 60.

30. The method of claim 29, wherein the IV is from about 45 to about 58.

ADD A5 ADD B6 ADD E1 ADD F6